

is effected in the following manner. The balloon is only partially filled with gas, and is then securely tied up. As it rises the external pressure is lessened and the gas inside expands, until finally the rubber is no longer able to stand the strain and the balloon bursts. A small parachute is used to prevent a too rapid fall of the meteorograph, and sometimes a second smaller balloon, filled to a less extent, so that it does not burst, is also attached; the second balloon takes the place of the parachute, but is employed that it may float over the position of the fallen meteorograph, and direct attention to it. With paper balloons an automatic arrangement is used by which the balloon is freed when it reaches a certain height. The general result is that the meteorograph returns to the earth within a time of about an hour, and within a distance of a hundred miles from the starting point.

Observations obtained by the help of kites have the advantage of being less costly, but they are dependent on the weather conditions, and it is not often that heights exceeding two miles are reached. At Lindenbergh in Germany, the best equipped station for the purpose in existence, last year a height of just on four miles was reached by a train of kites. Given sufficient wind it is a perfectly simple process to send a kite up to the height of a few thousand feet, although if the wind be very strong it is not so simple to draw it back again. The chief obstacle to attaining great altitudes is the wind resistance upon the cord or wire which holds the kite, and it is on this account that the strongest and thinnest obtainable steel wire is used. The wire introduces many technical difficulties; it is difficult and to some extent dangerous to handle, and although capable of withstanding a great strain if fairly used, if a kink is once formed the piece of wire in which it is, is utterly useless. Usually steel music wire, the kind of wire used in a piano in fact, of about 1-32in. in diameter is used; this will bear a weight of 250lbs., and weighs 16lbs. to the mile. With a good kite presenting 77 square feet of surface to the wind and 8000 feet of this wire, a vertical height of one mile is easily reached under favourable conditions of wind, and one kite of this size has carried a meteorograph to 8000 feet of height. The conditions are not always favourable; instead of a steady wind of twenty-five to thirty miles per hour, increasing somewhat with altitude, which affords the best conditions, it not infrequently happens that quite different velocities are found in different strata. It is impossible to get through a stratum in which the velocity is under fifteen miles per hour, and if a velocity of much over forty miles per hour is encountered in the lower strata, the kite is very likely to be damaged or the wire broken. At greater heights a higher velocity is not so likely to cause damage, since the air is less dense, and (a point of perhaps far greater importance) the wind is far steadier.

Hence it is easily seen that to reach very great heights with a train of kites, in addition to having apparatus of the best design and quality, exceptional weather conditions must hold, and the observer must succeed in straining his wire just short, but only just short, of its breaking point. The attempt very often ends in the breaking of the wire near the winch, and the departure of five or six miles of wire and six or eight kites.

Very interesting results have been given by the unmanned balloons. It has been found that when they have reached a great height they fall in some locality lying to the east of their starting point, not necessarily due east, but on a more easterly meridian. Since they pass far beyond the upper limit of the cirrus cloud, this fact confirms the statement that in the temperate latitudes the upper currents are always

from some westerly point. M. Teisserenc de Bort also finds that balloons sent up in a cyclone tend to move away from the centre at great heights, thus showing that the cyclonic circulation is not a mere surface phenomenon. He also states that at ten miles height the air is warmer over the cyclone, and colder over the anticyclone.

When observations by means of kites were first started by Mr. Rotch, at Blue Hill, Boston, U.S., it was hoped that the long disputed point as to the origin of cyclones would be elucidated; so far this has not been the case.

Ferrel, the well-known American meteorologist, held that cyclones were convectional effects, and that they were maintained chiefly by the latent heat of condensation of the vapour in the central and rainy part. Dr. Hann on the other hand considers that cyclones are what may be described as driven eddies in the general circulation of the atmosphere. Opinion on the Continent, based on the results of observations obtained by balloons and kites, seems to be in favour of Dr. Hann's hypothesis, but Mr. Clayton, of Blue Hill, U.S., considers that the ascents there made favour the convectional theory. The results of some two hundred kite ascents which I have obtained in England and Scotland, with an average height of about one mile, seem to me to give no evidence one way or the other. I think, however, that a fundamental error has generally been assumed in the discussion. We know that in a gas in equilibrium under a conservative system of forces the isothermal and isobaric surfaces must be identical; this point at least is not open to question. It is not, therefore, the proper test to consider whether the temperature in a cyclone is greater or less than in an anticyclone at the same height, but the test is whether it be greater or less at points on the same isobaric surfaces; and the isobaric surfaces in temperate latitudes may well differ from surfaces of equal height above mean sea level by a thousand feet or more.

W. H. DINES.

THE BICENTENARY CELEBRATION OF THE BIRTH OF BENJAMIN FRANKLIN.

THE oldest scientific society in the new world is, I believe, the American Philosophical Society of Philadelphia. The Society was founded by Benjamin Franklin, son of an English father and born at Boston, Massachusetts, in January, 1706. It was natural that the bicentenary of the birth of a man of such extraordinary and diverse genius as Franklin should be commemorated in his native land, and accordingly during the past winter the Society issued invitations to leading universities and societies throughout the world to be present, through their delegates, at a festival to be held at Philadelphia from April 17 to 20. The date of the meeting was no doubt chosen because Philadelphia is liable to be intolerably hot in the summer, and would certainly be deserted at that season by many of the leading members of the Society, yet the chosen time was not a good one for European delegates, since academic duties would certainly preclude any large attendance from across the seas. Although, then, there were actually present only some half-dozen delegates from Europe, yet many European societies were represented by honorary members of American nationality, and sent addresses of congratulation to the Philosophical Society. The United States and Canada were naturally in great force, and the hundred and fifty or two hundred delegates who attended formed an imposing body of men of scientific repute.

The proceedings began on the evening of April 17,

when the President of the Society, Prof. Edgar Smith, presided over a meeting of delegates for the reception of addresses. The President began by a speech in which he set forth the share taken by Franklin in the foundation of the Philosophical Society, and the bearers of addresses then handed to him successively, in the chronological order of the several foundations, the documents with which they had been entrusted. I myself had the honour of presenting addresses from Cambridge, the Royal Society, the Royal Institution, the British Association, and the Royal Meteorological Society. I do not know the whole number of addresses, but 126 bodies were represented in one way or another. The evening ended with an interesting ceremony, when Mr. Carnegie, in his robes as Lord Rector of the University of St. Andrews, conferred the degree of doctor on Miss Irwin, a great-granddaughter of Franklin; she is principal of Radcliffe Hall, which bears nearly the same relation to Harvard University that Newnham and Girton do to Cambridge.

Wednesday, April 18, was devoted to the reading of scientific papers, as in a sectional meeting of the British Association. The session was continued on the afternoon of Friday, and twenty-three papers in all were read. Amongst the papers which appeared to excite the greatest interest were those by Chamberlin, de Vries, Pickering, Hall, and Lorentz. I myself gave an account of a paper recently presented to the Royal Society, but as yet unpublished; but before doing so I had the pleasure of presenting to the Philosophical Society two Wedgwood medallions of Benjamin Franklin and of Erasmus Darwin. The archives of the Society show (what I was not aware of) that both Erasmus Darwin and my father had been honorary fellows—an honour which I share myself.

On Thursday morning, April 19, the University of Pennsylvania (of which Franklin was the initiator) conferred, at the hands of its Provost, Mr. Harrison, a number of honorary degrees in the fine theatre called the Academy of Music. The whole pit was occupied by students, and a national flavour was conferred on the ceremonies by their staccato college yell, and by their singing college songs.

An altogether exceptional feature of the ceremony was that a degree was conferred on the King, who was represented by Sir Mortimer Durand, H.M. Ambassador at Washington. In announcing this degree the Provost read with great effect the celebrated speech on England from Henry V. It is pleasant to record the enthusiastic cheers which the whole audience gave, standing, as the Ambassador was hooded. Some fifteen or twenty degrees were afterwards conferred, and the recipients—amongst whom I may name de Vries, Lorentz, Marconi, and Rutherford—were greeted with hearty cheers by the students. Afterwards the Attorney-General of Pennsylvania, Mr. Carson, gave an address on the shares borne by Franklin and by subsequent benefactors in the foundation of the University. In the afternoon there was a public procession to the grave of Franklin, but as I was not present I am unable to give any account of the proceedings.

On Friday morning, April 19, we heard some interesting speeches in the theatre by Mr. Furness, President Elliot, and Mr. Choate, formerly ambassador in London, on the various sides of Franklin's character and activity. On the stage in full view of the audience was the portrait of Franklin which had been removed from America by General Grey at the time of the revolutionary war. It has just been presented to the President of the United States by Lord Grey, Governor-General of Canada, and its ultimate destination will, I believe, be the White House at Washington. This graceful act of international courtesy is highly appre-

ciated in America, and the fact that it coincides with the bicentenary of Franklin's birth can hardly be merely accidental.

After the addresses of which I have spoken came the presentation to the Republic of France, through the French Ambassador, M. Jusserand, of a gold medal commemorative of Franklin. All who have studied the history of the revolutionary war know the importance of Franklin's residence in Paris as a determining factor in the outcome of the war. It may easily be imagined how great was the enthusiasm created by this ceremony.

The festival closed with a banquet in the evening at which there were many striking speeches. An American dinner is managed somewhat differently from our own, for the toast-master is not, as with us, a servant with a stentorian voice, but is the most highly honoured of the hosts of the occasion. Dr. Weir Mitchell, the illustrious physician, performed this arduous task, and gave us a number of appropriate little speeches to the admiration of all.

To describe the other speeches would be simply tedious, but I may mention the excellent speech of M. Jusserand, who referred with the most exquisite tact to the appalling disaster of San Francisco, then at its full height. M. Jusserand is the most accomplished living student of England of the Plantagenet times, and his speech, although clothed in English, retained all the grace of its French origin.

It was natural that the ruin and misery at San Francisco should exercise a certain depressing influence on all, but those responsible for the proceedings determined, rightly, as I think, to carry them through as planned.

Those who have taken part in such festivals in America need not be told that the organisation was admirable and the hospitality unbounded.

G. H. DARWIN.

NOTES.

THE seventy-eighth annual meeting of the German Association of Naturalists and Physicians will be held at Stuttgart on September 16-22.

A REUTER message from Rome on May 5 reports that the volcano of Stromboli is in active eruption. Advices received from Tacna, Chile, state that a violent earthquake shock was felt in that city on May 6, the vibrations lasting thirty-five seconds. The shock was also felt at Arica.

THE death is announced of Prof. Eugène Renevier, professor of geology and palaeontology at the University of Lausanne. Prof. Renevier was president of the Swiss Geological Society and president of the Simplon Geological Society.

ON Saturday week, May 19, Sir James Dewar will deliver the first of a course of two lectures at the Royal Institution on "The Old and the New Chemistry." The Friday evening discourse on May 18 will be delivered by Prof. Arthur Schuster, on "International Science."

THE second annual dinner of the London section of the Society of Dyers and Colourists will be held on Wednesday, May 23. Persons interested in dyeing and the allied industries who are not members of the society are specially invited. Particulars may be obtained from the hon. secretary, Mr. Wallace Burton, 219 Shooters Hill Road, Blackheath, S.E.

At the final meeting of the sixth International Congress of Applied Chemistry on Saturday, it was resolved that the seventh congress shall be held in London, with Sir